No. 815,629. PATENTED MAR. 20, 1906.

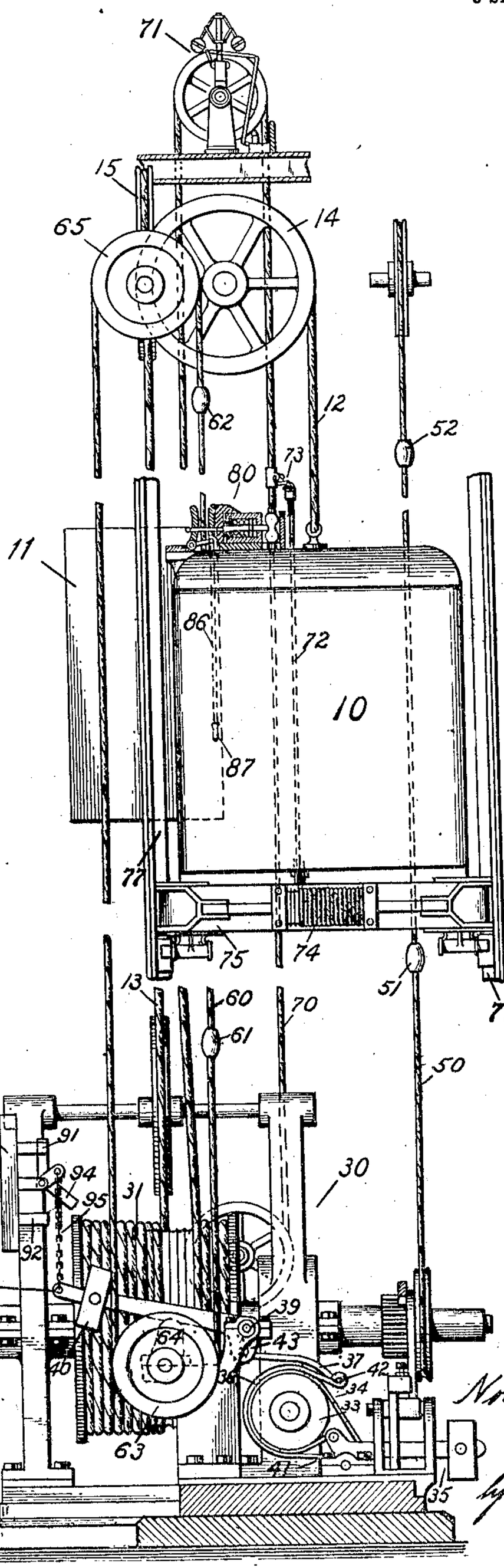
N. P. OTIS & A. SUNDH.

EMERGENCY BRAKE FOR ELEVATORS.

APPLICATION FILED JAN. 15, 1903.

3 SHEETS—SHEET 1.

Fig. 1.



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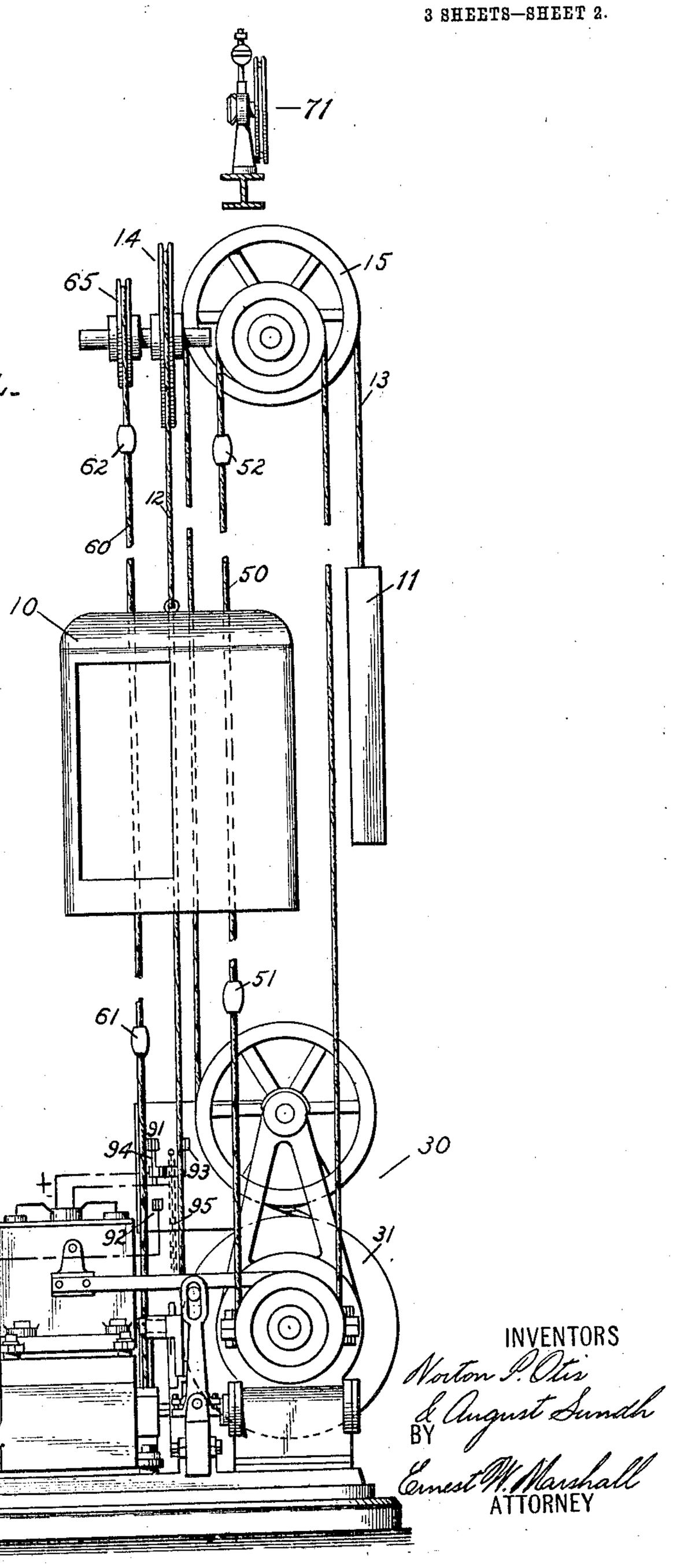
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

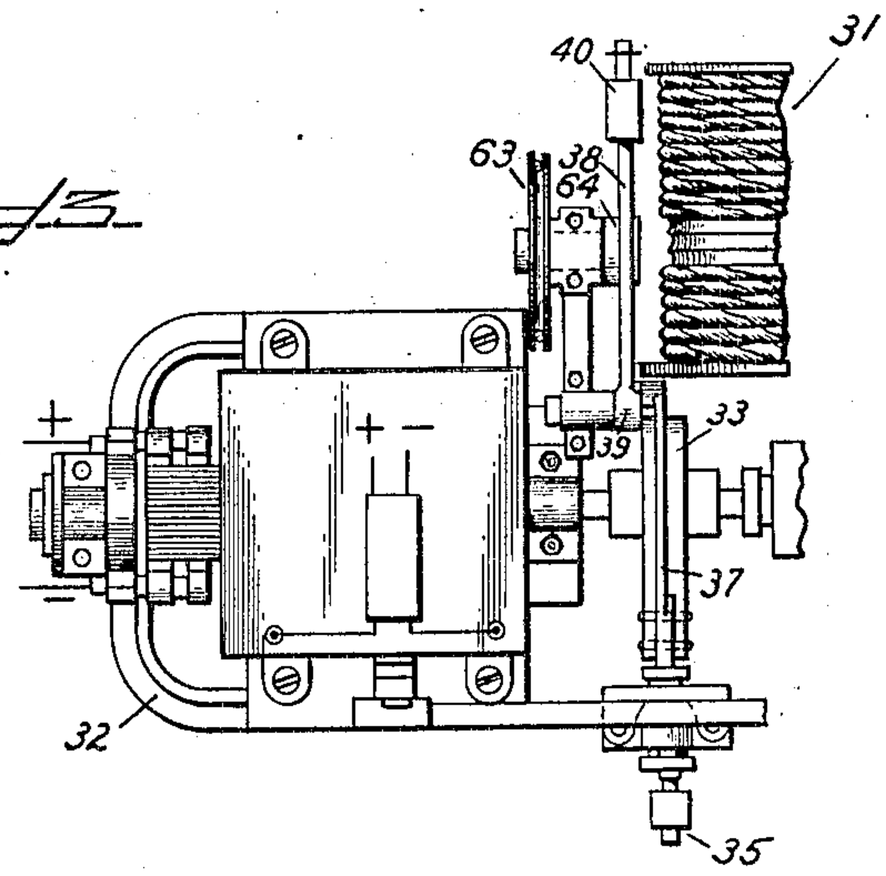


Fig. 4.

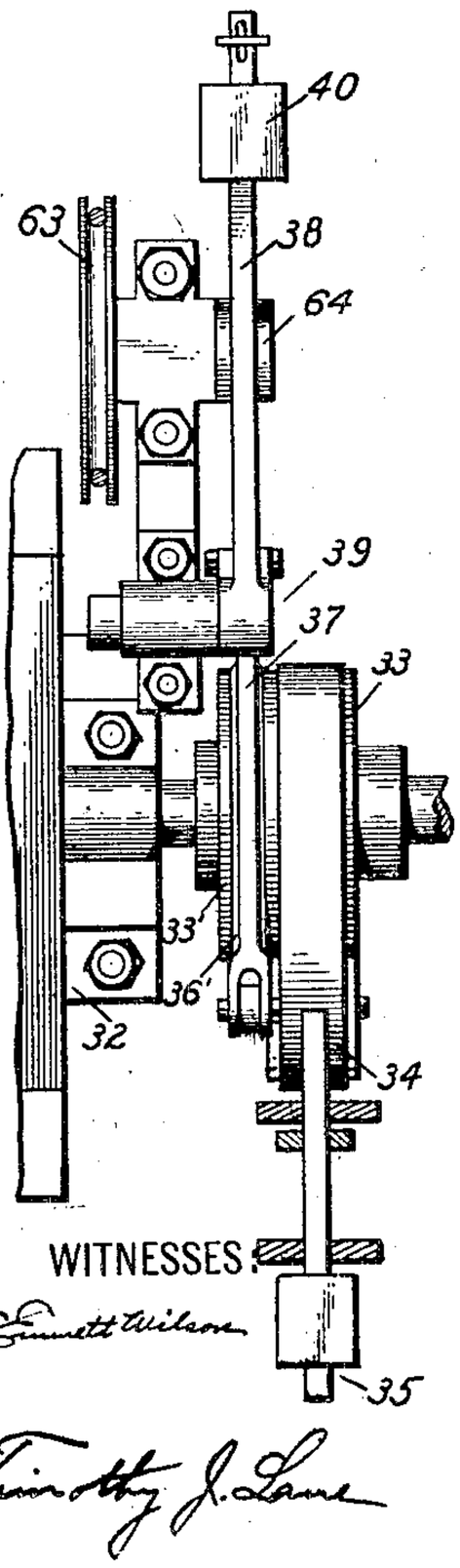
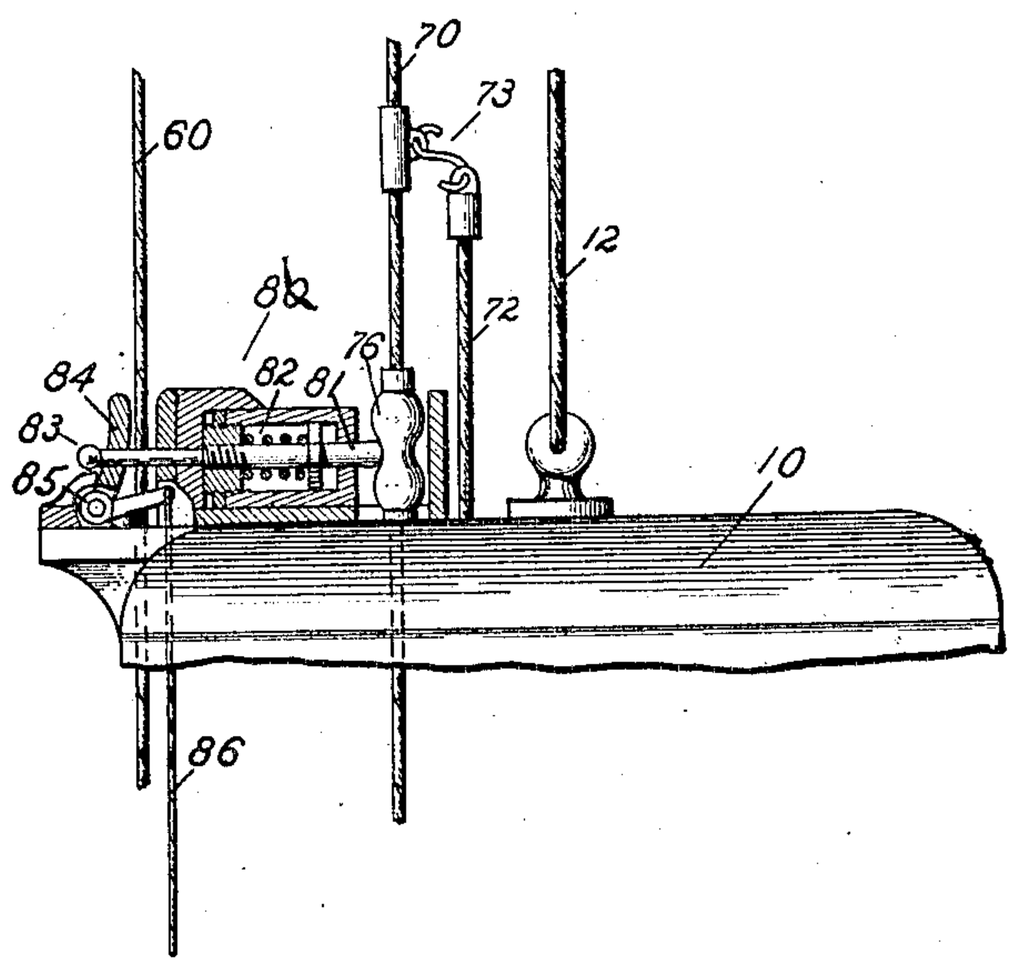


Fig. 5.



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UNITED STATES PATENT OFFICE.

NORTON P. OTIS AND AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNORS TO OTIS ELEVATOR COMPANY, OF EAST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

EMERGENCY-BRAKE FOR ELEVATORS.

No. 815,629. Specification of Letters Patent. Patented March 20, 1906.

Application filed January 15, 1903. Serial No. 139,222.

To all whom it may concern:

Be it known that we, NORTON P. OTIS and AUGUST SUNDH, citizens of the United States, and residents of the city of Yonkers, in the county of Westchester and State of New York, have invented new and useful Improvements in Emergency-Brakes for Elevators, of which the following is a specification.

Our invention relates to an emergency-brake for elevators, and has for its object to provide a safety or emergency brake in addition to the ordinary brake on the machine or to work in conjunction with such ordinary brake. By our improvement such brake is so arranged that it is at all times under the control of the operator in the car and is also so arranged that it will automatically stop the car if it runs beyond the limits of its travel. It is also so arranged that it will be automatically applied whenever the safety device on the car is brought into action. This is a desirable feature, as it insures the immediate stopping of the hoisting-machine whenever the car is stopped by the safeties and will thus prevent the unwinding of the ropes if the car was descending or undue strain on the ropes if the car was ascending.

Another object of our invention is to make our device in such form that it may be readily applied to machines already installed and in use.

Our invention relates to the construction and arrangement of parts, substantially as set forth in the following specification.

Referring to the drawings, Figure 1 represents an end elevation of an elevator apparatus and certain parts of its hoisting-machine with our improvement attached. Fig. 2 is a side elevation of the same apparatus. Fig. 3 is a plan view of our brake and certain connected parts of the elevator apparatus. Fig. 4 is a plan view of a modification of the same. Fig. 5 represents in elevation the top of an elevator-car with certain parts of our apparatus attached.

Similar figures of reference in the drawings indicate corresponding parts in the various figures.

10 represents a car; 11, its counterweight.

30 is a hoisting-machine. A hoisting-cable 12 is attached to the car and runs up over a sheave 14 at the top of the hatchway, thence down to the winding-drum 31 of the hoisting-machine 30, to which it is attached. The cable 13 connects the counterweight 11 to the winding-drum 31 over the sheave 15.

32 is an electric motor which drives the hoisting-machine.

33 is a coupling or pulley attached to the armature-shaft of the motor.

34 is a strap or band brake which is applied to this pulley by the weighted lever 35. Outside of this band-brake we place another strap 36, connected through a link 37 to a lever 38, which is pivoted at 39 and carries a weight 40. This arm is supported by a cam 64.

50 is the operating-rope, with stop-balls 51 52 attached to it.

60 is the emergency-brake rope, with stop-balls 61 62 attached to it. This rope is attached to a sheave 63 on the hoisting-machine. This sheave is keyed to a shaft, to which is also keyed the cam 64.

70 is a governor-rope which runs over the sheave of a speed-governor 71 at the top of the hatchway. A safety-rope 72 is attached to the governor-rope 70 at 73, and its other end is wound around a drum 74 on the safety device 75 under the car. This safety device is adapted to arrest the motion of the car by gripping the guides 77.

80 is a device to make the governor-rope travel with the car unless it is caught and locked by the governor and to lock the emergency-brake rope 60 to the car 10 whenever the governor catches the governor-rope. It consists of a plunger 81, pressed against a lug 76 on the governor-rope by a spring 82. The opposite end 83 of the plunger 81 goes behind a bell-crank lever 84, which is pivoted at 85. To one end of this bell-crank lever is attached a cord 86, which has a handle 87 at its end.

90 is an electric switch, with its contacts 91, 92, and 93 and its knife-blades 94, which are connected to the lever 38 by the chain 95.

96 is a resistance, the purpose of which will appear later.

The construction and arrangement of the car, counterweight, and winding-engine are well known and need no further description here. We have shown at 75 a car safety device of well-known construction; but our improvement may be used as well with other kinds of elevator-safeties and with those

adapted to stop the car on its upward as well as on its downward movement. The one we have shown is the subject-matter of United States Patent No. 376,374, granted to A. C. Ellithorpe, January 10, 1888. Briefly stated, it consists of jaws which are arranged to grip the elevator-guides whenever the car attains excessive speed. This is accomplished by a speed-governor 71, which is arranged to grip and lock a rope 70, which ordinarily travels with the car, thus holding it still, while a further motion of the car will cause a safety-rope 72 to be unwound from the drum 74. This imparts motion to the drum 74 which causes the jaws to firmly grip the guides 77 by means of mechanism fully disclosed in the patent above cited. The governor-rope 70 is connected to the car by a yielding contact (represented by the lug 76) attached to the rope, with the plunger 81, which is attached to the car, being pressed against it by means of a spring 82. The tension of this spring is sufficient to carry the rope 70 along with the car under ordinary conditions; but if the car attains excessive speed the governor 71 will catch and lock the rope 70, the lug 76 will slip away from the plunger 81, and so the rope 70 will no longer be connected to the car. All this arrangement is well known to those skilled in the art. To adapt this arrangement to our device, we have carried the other end of the plunger 81 behind a bell-crank lever 84, the function of which will appear hereinafter.

The operating-rope 50 is run through the car and to the winding-engine and is arranged to give the operator in the car control over the motor 32 and the brake (represented by 33, 34, and 35) for starting, stopping, and reversing the motion of the car. When the car runs down, it will strike the stop-ball 51 at the bottom of its travel, and thus move the rope 50 and automatically bring itself to rest at its lowest landing. When the car runs up, it will have a similar effect by striking the stop-ball 52 and will automatically stop itself at its upper landing. The brake (represented by 33, 34, and 35) is one of ordinary construction and consists of a coupling or pulley 33, securely keyed to the armature-shaft and surrounded by a strap 34, of leather or other suitable material, which is tightened around said pulley by a weighted lever 35 and arranged to be released by mechanical connections to the hand-rope 50. Outside of this strap 34 we have placed another band or strap 36, placed far enough away from it not to interfere with its ordinary operation. This strap 36 is rigidly fastened to a base at 41, and its other end 42 is connected, through a connecting-rod 37, to a bell-crank lever at 43. This bell-crank lever is pivoted at 39 and has a long arm running out to 38 and carrying a heavy weight 40. This arm is supported by a cam 64. The cam 64 is keyed to a shaft to which is also attached a pulley 63, so that the cam and the pulley move together. The emergency-brake rope 60 passes under and is attached to this pulley 63, thence up by the car and over another pulley 65 at the top of the hatchway. This rope can be moved by the car if it should strike the stop-balls 61 or 62, or the operator in the car can cause it to be moved. This is accomplished in the following manner: The bell-crank lever 84 is normally in the position shown out of contact with the rope 60; but it is adapted to be moved into contact and to grip the rope 60, and thus cause it to move with the car. For this purpose the cord 86 is brought down from the bell-crank lever into the car and has a handle at its end within easy reach of the operator. Thus the operator by pulling on this cord 86 will lock the rope 60 to the car 10, and the movement of the car will move the rope. The rope 60 can be run through the car when desired and can then be moved directly by hand without the intervention of such an arrangement as the bell-crank lever 84 and the cord 86. Whenever the speed-governor catches and locks the governor-rope 70 and causes it to become detached from the car, as above described, the plunger 81 will move forward under the action of the spring 82, and the part of it which goes behind the bell-crank lever 84 will move the latter forward, so that it will grip the emergency-brake rope 60 and lock it to the car, so that it will move with the car.

At 90 we have shown an electric switch through which are run the mains from the power-supply. The upper contacts 91 93 of this switch are normally closed while the machine is in use by its knife-blades 94, as shown. The knife-blades 94 are connected by a chain 95 to the long arm of the bell-crank lever at 38 and are so arranged that whenever the bell-crank lever drops down the main-line circuit to the motor will be broken at 91 and 93 and another circuit will be closed at the contact 92 through the armature of the motor 32 and a resistance 96.

The modification shown in Fig. 4 has the coupling or pulley 33 made wider than usual, as shown at 33′, and to this is fitted a separate brake-band 36′ instead of the extra strap 36, shown in Fig. 1.

During the usual operation of the elevator this device has no effect whatever. If, however, there is an occasion to stop the elevator positively and quickly without any reference to its usual controlling devices, the operator by pulling on the cord 86 will move the bell-crank lever 84 against the rope 60 and cause the latter to move with the car. This will cause the sheave 63 and the cam 64 to be moved around, so that the cam will no longer support the bell-crank lever 38. The long arm of the latter will descend by the action of the weight 40, and this will cause the strap

36 to be brought up against the brake-strap 34 and will push the latter against the coupling 33 with great force. At the same time the main-line current to the motor will be broken at 91 and 93 by the knife-blades 94 being pulled open by the chain 95. This will cause the machine and the car to stop. We sometimes add the contact 92 and arrange the connections so that when the main-line switch is opened as just described another circuit will be closed at 92, which will short-circuit the motor-armature through a resistance 96, and this will add to the braking effect and cause the machine to come to rest more quickly.

The stop-balls 51 and 52 are arranged to stop the car automatically at its lower and upper landings, as already explained. If for any reason these should fail to stop the car at these landings, it will strike the stop-balls 61 or 62 on the rope 60, which are placed, respectively, below and above the stop-balls 51 and 52 and beyond the reach of the car in its usual operation. Thus if the car runs beyond its lower or upper landings it will move the rope 60, which will turn the sheave 63 and the cam 64 and apply the emergency-brake and stop the car. Whenever the car safety device comes into use, the same movement which brings it into action—that is, the detachment of the governor-rope from the car at 76 81—will also lock the emergency-brake rope to the car, as has already been described, and as the further movement of the car acts to apply the grips of the safety to the guides 77 it will move the emergency-brake rope 60, apply the emergency-brake, and stop the hoisting-machine at the same time the car is being stopped by the action of the safety device.

The operation of the modification shown in Fig. 4 is the same as that just described, except in this case an independent brake 36′ is applied to the pulley 33 at 33′ by the weight 40 when the lever 38 is released.

From the construction shown it is evident that after the emergency-brake has been applied it may be readily released or reset by moving the emergency-brake rope 60 back to its original position, thus lifting the lever 38 into its normal position by means of the cam 64.

While we have shown our device applied to an elevator of the direct electric type, it is evident that it may be applied to other forms of elevators which can be stopped by a brake. The emergency-brake shown in Fig. 4 may also be applied to some forms of elevators which do not depend upon a brake for stopping. The apparatus is operative without the switch 90. This switch is used only in connection with electric elevators. When the apparatus is applied to other than electric elevators, an equivalent for the switch 90—such as a valve, belt-shifter, &c.—may be used, or the brake may be used without such a device. We have shown it applied to a well-known type of brake, but do not wish to confine ourselves to this particular kind, as it is just as applicable to many other types.

What we claim as new, and desire to cover by Letters Patent, is—

1. The combination with a hoisting apparatus, of a car, a brake on the hoisting apparatus, means for applying said brake, and additional independent means arranged to be controlled from said car for operating said brake.

2. The combination with a hoisting apparatus, of a car, a brake on the hoisting apparatus, means for operating said brake, additional independent means for operating said brake from the car, and means for actuating said additional brake-operating means to apply said brake automatically when the car reaches the desired limits of travel.

3. The combination with a hoisting apparatus, of a car, a brake on the hoisting apparatus, means for operating said brake, and additional independent means for applying said brake, means comprising a handle in the car for controlling said additional means, whereby the brake may be applied at will.

4. The combination with a hoisting apparatus, of a car, a brake, means for applying said brake, automatic means for controlling said applying means, and additional independent means for operating said brake from the car or automatically if the car runs beyond the desired limits of its travel.

5. An electric elevator comprising a motor, a switch for said motor, a brake, means for operating said brake, and additional independent means for operating said brake and opening said switch from the car or automatically if the car goes beyond the desired limits of its travel.

6. An electric elevator comprising an electric motor, a main-line switch for said motor, resistance in circuit with the armature of said motor, a brake, means for operating said brake, and additional independent means for operating said brake, opening said switch and short-circuiting the motor-armature through said resistance, said additional means being arranged to be operated from the car or automatically if the car runs beyond the desired limits of its travel.

7. An electric elevator comprising a car, an electric motor, a main-line switch for said motor, a brake, means for applying said brake, automatic means controlling the applying means to stop the car substantially at the limits of its travel, and additional independent means for opening said main-line switch and operating said brake, said additional means being arranged to be controlled from the car or automatically if the car runs beyond the limits of its travel.

8. An electric elevator comprising an elec-

tric motor, a main-line switch for said motor, a resistance in a normally open circuit with the armature of said motor, a brake, means for applying said brake to stop the car, means for controlling said brake-applying means, automatic means for operating said controlling means when the car reaches the limits of its travel, additional independent means for applying said brake and substantially at the same time opening said main-line switch, and short-circuiting the motor-armature through said resistance, means arranged to be actuated from the car for controlling said additional brake-applying means, and means for automatically actuating said last-named controlling means if the car runs beyond the limits of its travel.

9. The combination with hoisting apparatus, of a car, a brake, means for automatically operating said brake to stop the car at predetermined points at the ends of its travel, and additional means for applying said brake comprising a weighted lever, means comprising an emergency-brake rope for releasing said weighted lever to apply the additional braking means, said rope being arranged to be operated from the car or automatically by the car itself if it runs beyond said predetermined points.

10. An electric elevator comprising an electric circuit arranged to be connected to a source of electrical supply, a brake, means for operating said brake, and additional independent means for operating said brake and interrupting said circuit.

11. In combination, an electric elevator comprising electric circuits arranged to be connected to a source of electrical supply, a brake, means for operating same, and additional means for operating said brake, interrupting the circuit to the source of electrical supply and short-circuiting the motor-armature.

12. An electric elevator comprising a brake, means for applying said brake, a car, means for controlling said brake-applying means from said car, an electric motor, circuits for the same, an additional brake, and means for automatically interrupting a circuit to the motor, short-circuiting the motor-armature and operating said additional brake if the car should go beyond the limits of its desired travel.

13. The combination with a hoisting apparatus, of a car, a safety device on said car, a brake, means for applying said brake, means arranged to be operated from the car for controlling said brake-applying means, means for automatically operating said controlling means if the car runs beyond its desired limits of travel, and additional means for operating said controlling means if the safety device on the car is brought into action.

14. An elevator apparatus comprising in combination a car with a safety device, hoisting apparatus, a brake for the same, means for operating said brake, additional independent means comprising a weighted lever for applying said brake, means for holding said lever out of its brake-applying position, means comprising an emergency-brake rope for releasing said holding means to apply the brake, means for locking said rope to the car so that the latter may move the rope to cause the brake to be applied, manual means for operating said locking means, and automatic means arranged to be actuated when the safety device acts for operating said locking means.

15. An elevator apparatus comprising a car combined with hoisting apparatus, a brake, means comprising a weighted lever for applying said brake, means for normally holding said lever out of its brake-applying position, means comprising a rope for releasing said holding means and causing said brake to be applied, means for locking said rope to the car so as to travel therewith and actuate said releasing means, manual means for operating said locking means, a safety device on the car, means actuated by the safety device when in operation for automatically operating said locking means, and additional means for operating the releasing-rope if the car runs beyond its limits of travel.

16. An electric elevator comprising a car provided with a safety device, a brake, means for operating same, electromechanical means for hoisting the car, a circuit and main switch for the same, additional independent means for applying said brake and opening the said main switch to interrupt the circuit to said electromechanical means, means for controlling the application of said additional brake-applying means and releasing the same from the car, means for actuating said controlling means to stop the car if the car runs beyond its desired limits of travel, and further means for actuating said controlling means to stop the car when the said safety device is brought into operation.

17. An electric elevator comprising hoisting apparatus including an electric motor, a circuit and main switch for said motor, a resistance in a normally open circuit with the armature of said motor, a brake for said hoisting apparatus, means for operating said brake, a car, a safety device on said car, additional means for applying said brake and substantially at the same time opening said main switch and short-circuiting the motor-armature through said resistance, means for controlling and actuating said brake-applying means for respectively applying and releasing the same from the car, means for automatically actuating said controlling means if the car goes beyond the desired limits of its travel, and means actuated by said safety device when brought into action for automatically actuating said controlling means to re-

lease said additional brake-applying means and stop the car.

18. An electric elevator comprising a car with a safety device, hoisting apparatus, an electric motor for operating said hoisting apparatus, a circuit and main switch for said motor, a resistance, a brake on said hoisting apparatus, means for operating said brake, automatic means for applying said brake when the car reaches the desired limits of its travel, additional independent means for applying said brake, opening said switch to interrupt the circuit to the motor, and short-circuiting the motor-armature through said resistance, means for controlling the application of said brake from the car, automatic means for operating said controlling means when the car runs beyond the desired limits of travel, and additional means for automatically operating said controlling means to apply the brake and stop the car, said additional means being arranged to be actuated when the safety device is brought into action.

19. An elevator, comprising a car, a brake, means for applying said brake, means for controlling from the car in case of emergency the application of said brake, automatic means for operating said controlling means if the car runs beyond the limits of its travel, and additional means for automatically operating said controlling means when the safety device acts.

20. An elevator comprising a car with a safety device, a brake and means for operating said brake to stop the car automatically at the desired limits of its travel, an additional brake, means for operating said brake from the car, means for automatically actuating part of said brake-operating means to cause another part to apply said additional brake and stop the car if the car runs beyond the limits of its travel, and additional means for actuating the first-named part of said additional brake-operating means when the said safety device is brought into action.

21. An electric elevator comprising a car with a safety device, a brake, means for operating same, an electric motor, a circuit and main switch for said motor, an additional brake, means for applying same, means for controlling the application of said brake from the car and substantially at the same time opening said switch to interrupt the circuit to said motor, automatic means for operating said controlling means if the car runs beyond the limits of its travel, and additional means for automatically operating said controlling means, said additional means being controlled by the said safety device.

22. An electric elevator comprising a car with a safety device, a brake, means for operating same, an electric motor, a circuit and main switch for said motor, an additional brake, means for applying same, means for controlling the application of said brake from the car and substantially at the same time opening said switch to interrupt the circuit to said motor and short-circuiting the motor-armature, automatic means for operating said controlling means if the car runs beyond the limits of its travel, and additional means for automatically operating said controlling means, said additional means being controlled by the said safety device.

23. An electric elevator comprising a car with a safety device, a brake, means for operating said brake, an electric motor, a circuit for said motor, additional independent means for operating said brake and interrupting the circuit to said motor, and means for actuating part of said additional brake-operating means from the safety device to cause the application of the brake when the safety device is brought into action.

24. The combination with an elevator-car, hoisting apparatus therefor, an electric motor for operating said hoisting apparatus, a brake, means for applying said brake, means for controlling said brake-applying means from the car, an additional brake coacting with said first-named brake, means for operating said additional brake from the car or automatically if the car should run beyond the limits of its desired travel, and means coacting with said additional brake-operating means for interrupting the circuit to the motor upon the application of said additional brake.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

NORTON P. OTIS.
AUGUST SUNDH.

Witnesses:
THOS. M. LOGAN,
ERNEST W. MARSHALL.